CLAIMS

1. Method for controlling a dialysis machine comprising:
- a filter (1) having a first and a second compartment (3, 4) separated by a semi-permeable membrane (2);
- a first circuit (5, 6) connected to the first compartment (3) for a liquid including a liquid component, a cellular component that is retained by the membrane (2) and solutes that pass through the membrane (2);
- a second circuit (10, 11) connected to the second compartment (3) for a dialysis fluid;
- means (15) for circulating the liquid to be filtered in the first circuit at an inlet flow upstream of the filter (1);
- means (17, 18, 19) for causing a controlled flow of the liquid component and of the solutes through the membrane (2);
the method comprising the following steps:
• circulating the liquid to be filtered in the first compartment (3) of the filter (2);
• causing a controlled flow of the liquid component and of the solutes through the membrane (2);
• determining (50, 55) a value of a first and a second parameters (UFR, Qp) correlated respectively with the controlled flow of the liquid component through the membrane (2) and with the flow of the liquid component at the inlet of the first compartment;
• calculating (60) a filtration factor (FF) as a function of the value of the first and second parameters (UFR, Qp);
• checking (65) whether the filtration factor (FF) has a predetermined relation with a limit value of admissibility;
• generating (70) a signal indicating the result of the verification.

2. Method according to Claim 1, characterized in that the controlled flow of the liquid component through the membrane (2) or the inlet flow of the liquid to be filtered is altered if the filtration factor (FF) does not match the predetermined relation.

3. Method according to Claim 1 or 2, characterized in that the first parameter is the ultrafiltration rate (UFR) and in that the second parameter is the plasma flow rate (Q_p).

4. Method according to Claim 3, characterized in that the step of determining the value of a second parameter comprises the steps of:

- determining an inlet flow rate Q_b of the liquid to be filtered;
- determining the concentration Hct of the cellular component in the inlet liquid; and

and in that the calculation step comprises the calculation of the filtration factor (FF) according to the formula:

$$FF = UFR/[Q_b(1-Hct)]$$

5. Method according to Claim 4, characterized in that the checking step comprises checking whether the filtration factor (FF) is below a predetermined maximum threshold value.

6. Method according to Claim 4 or 5, characterized in that the step of determining the concentration Hct of the celluar component comprises measuring the haemoglobin value and dividing the haemoglobin value by a constant coefficient.

7. Method according to one of Claims 1 to 6, characterized in that it further comprises the following steps:

- detecting (80) pressure values (P_{bi}, P_{bo}) at the inlet and outlet of the first compartment (3) and pressure values (P_{di}, P_{do}) at the inlet and outlet of the second compartment (4);
- calculating (85) an inlet transmembrane value (TMP_i) as the difference between the pressure value (P_{bi}) at the inlet of the first compartment (3) and the pressure value (P_{do}) at the outlet of the second compartment (4) and an outlet transmembrane value (TMP_o) as the difference between the pressure value at the outlet (P_{bo}) of the first compartment

(3) and the pressure value (P_{di}) at the inlet of the second compartment (4);
- checking (90) whether the inlet (TMP_i) and outlet (TMP_o) transmembrane values satisfy predetermined relations with respective threshold values;
- generating (70) a signal indicating the result of the checking step.

8. Method according to one of Claims 1 to 7, characterized in that it further comprises the following steps:
- detecting (80) pressure values (P_{bi}, P_{bo}) at the inlet and outlet of the first compartment (3) and pressure values (P_{di}, P_{do}) at the inlet and outlet of the second compartment (4);
- calculating (85) an inlet transmembrane value (TMP_i) as the difference between the pressure value (P_{bi}) at the inlet of the first compartment (3) and the pressure value (P_{do}) at the outlet of the second compartment (4) and an outlet transmembrane value (TMP_o) as the difference between the pressure value at the outlet (P_{bo}) of the first compartment (3) and the pressure value (P_{di}) at the inlet of the second compartment (4);
- calculating (85) an average transmembrane value between the inlet transmembrane value and the outlet transmembrane value;
- calculating (95) a value of the actual permeability as the ratio of the value of the first parameter to the average transmembrane value;
- checking (100) whether the actual permeability value satisfies a respective predetermined relation with respect to threshold values;
- generating (70) a signal indicating the result of the checking step.

9. Dialysis machine (35) for treatment of a liquid to be filtered, comprising a liquid component, a cellular component and solutes, the machine comprising:
- a filter (1) having a first and a second compartment (3, 4) separated by a semi-permeable membrane (2);

- a first circuit (5, 6) for the liquid to be filtered, comprising a liquid inlet line (5) connected to an inlet of the first compartment (3) and a liquid outlet line (6) connected to an outlet of the first compartment (3);
- a second circuit (10, 11) for a dialysis fluid comprising a dialysis liquid inlet line (10) connected to an inlet of the second compartment (4) and a dialysis liquid outlet line (11) connected to an outlet of the second compartment (4);
- first pumping means (15) connected to the first circuit (5, 6) for circulating the liquid to be filtered through the first compartment (3);
- second pumping means (17, 18, 19) connected to the second circuit (10, 11) for circulating a dialysis fluid in the second compartment (4) and for causing a flow of part of the liquid component and of the solutes through the membrane (2);
- means for detecting (50) the value of a first parameter correlated with the controlled flow of the liquid component through the membrane (2) and the value of a second parameter correlated with the flow of the liquid component at the inlet of the filter (2);
- first means for calculating (60) a filtration factor FF as a function of the value of the first and second parameters;
- first comparison means (65) for comparing the filtration factor (FF) with a limit value of admissibility; and
- signaling means (70) for generating a signal (A) indicating the result of the comparison.

10. Dialysis machine according to Claim 9, characterized in that it further comprises first control means (75) for controlling one of the first and second pumping means (15, 17, 18, 19) and altering one of the inlet flow of the liquid to be filtered and the controlled flow of the liquid component through the membrane (3) when the filtration value does not have an admissible value.

11. Dialysis machine according to Claim 9 or 10, characterized in that the first parameter is a rate of ultrafiltration (UFR) and the second parameter is a plasma flow rate (Q_p).

12. Dialysis machine according to one of the Claims 9 to 11, characterized in that the detection means include means for detecting (50) the flow rate Q_b of the liquid circulated by first pumping means (15) and means (16, 55) for measuring the concentration Hct of the cellular component, and in that the calculation means (60) calculates the filtration factor (FF) according to the formula:

$$FF = UFR/[Q_b(1-Hct)]$$

13. Dialysis machine according to one of Claims 9 to 12, characterized in that it comprises:
- a first, a second, a third and a fourth pressure sensor (20 to 23) arranged respectively on the liquid inlet line (5), on the liquid outlet line (6), on the dialysis fluid inlet line (10) and on the dialysis fluid outlet line (11) for generating, respectively, a first, a second, a third and a fourth pressure value (P_{bi}, P_{bo}, P_{di}, P_{do});
- second means (90) for calculating an inlet transmembrane value (TMP_i) as the difference between the first and fourth pressure value and an outlet transmembrane value (TMP_o) as the difference between the second and third pressure value;
- second comparison means (90) for comparing the inlet and outlet transmembrane values with respective threshold values;
- and second control means (75) for controlling the first and second pumping means (15, 17, 18, 19) and for altering one of the inlet flow of the liquid to be filtered or of the controlled flow of the liquid component through the membrane (2) when the inlet and outlet transmembrane values do not have permissible values.

14. Dialysis machine according to one of Claims 9 to 13, characterized in that it comprises:
- a first, a second, a third and a fourth pressure sensor (20 to 23) arranged respectively on the liquid inlet line (5), on the liquid outlet line (6), on the dialysis fluid inlet line

(10) and on the dialysis fluid outlet line (11) for generating, respectively, a first, a second, a third and a fourth pressure value (P_{bi}, P_{bo}, P_{di}, P_{do});

- third means for calculating (85) an inlet transmembrane value (TMP_i) as the difference between the first and fourth pressure value and of an outlet transmembrane value (TMP_o) as the difference between the second and third pressure value;
- fourth means for calculating (85) an average transmembrane value (TMP_{ave}) between the inlet transmembrane value and the outlet transmembrane value TMP_o;
- fifth means (95) for calculating an actual permeability value (K_{uf}) as the ratio of the value of the first parameter and the average transmembrane value;
- third comparison means (100) for comparing the inlet TMP_i and outlet TMP_o transmembrane values with respective threshold values;
- and third control means (75) for controlling one of the first and second pumping means (15, 17, 18, 19) and for altering one of the inlet flow of the liquid to be filtered and the controlled flow of the liquid component through the membrane (2) when the inlet TMP_i and outlet TMP_o transmembrane values do not have respective permissible values.

15. Dialysis machine according to one of Claims 9 to 14, characterized in that the first pumping means comprise a first pump (15) installed in the liquid inlet line (5), and in that the second pumping means comprise a second pump (16) installed in the dialysis fluid inlet line (10), a third pump (18) installed in the dialysis fluid outlet line (11) and a fourth pump (19) installed in a branch (11a) of the dialysis fluid outlet line (11), and in that the first control means (75) control the fourth pump (19).